102
R6
2620

Paul E. Buffam

U. S. FOREST SERVICE
R-6

5250
Portland, Oregon
January 1965

ESTABLISHMENT REPORT
WOOLEY CREEK MOUNTAIN PINE BEETLE TREND PLOT
PAISLEY DISTRICT, FREMONT NATIONAL FOREST
1964

by

Paul E. Buffam
Division of Timber Management
Insect and Disease Control Branch

INTRODUCTION

The mountain pine beetle, Dendroctonus monticolae Hopk., is a serious pest of western white, lodgepole, sugar and young ponderosa pine in the West. In some years, damage is widespread. In 1963, mountain pine beetle infestations were detected on 580,000 acres of forested land in Washington and Oregon. Of this damage, 82 percent was in western white pine stands, 12 percent in lodgepole pine stands and 6 percent in young ponderosa pine stands. 1/

The mountain pine beetle generally infests mature or overmature western white pine and lodgepole pine stands of low vigor. Stagnated, young, pole-sized ponderosa pine stands that suffer from severe competition are often damaged by D. monticolae attacks. 2/ In Washington and Oregon, entire white or lodgepole pine stands may be decimated by this beetle. The amount of damage caused in young ponderosa pine stands before an outbreak subsides is not known. Therefore, a plot was established in 1964 on the Fremont National Forest to test methodology for determining the impact of beetle damage on pole-sized ponderosa pine stands.

1/ Orr, P. W., and Pettinger, L. F. Forest Insect Conditions in the Pacific Northwest During 1963. U.S. Forest Serv., Region 6, 60 pp. March 1964.

2/ Evenden, J. C., Bedard, W. D., and Struble, G. R. The Mountain Pine Beetle, an Important Enemy of Western Pines. U.S. Dept. Agr. Cir. 664, 25 pp., illus. March 1943.

OBJECTIVES

1. To determine the number, crown class and d.b.h. of trees killed by the mountain pine beetle in a given area.
2. To determine the number, crown class and d.b.h. of living trees remaining after a mountain pine beetle outbreak subsides.
3. To determine the pattern of kill within the stand--group versus single tree.

METHODS

In July 1964, a 10-acre plot was established near the Wooley Creek Burn, Paisley District, Fremont National Forest (see Figure 1, Appendix, for plot location). This area was recommended by Charles Sartwell, Jr., Entomologist, Division of Forest Insect Research, Pacific Northwest Forest and Range Experiment Station. Originally a 40-acre plot was planned, but too much time was required to establish and rate a plot of this size.

A square plot, 10 chains on a side, was established in one of the heavier damaged mountain pine beetle centers in the area. A staff compass and tape were used to lay out the boundaries. Interior lines were established perpendicular to the east and west boundaries at 2-chain intervals starting one chain from a corner (Figure 2, Appendix). Posts labeled with aluminum flashers were placed at 1-chain intervals along each of the five interior lines.

After all lines were established, 20 1/20-acre circular subplots were cruised. Using the west boundary as a base line, the subplots were taken at intervals of 2, 4, 6, and 8 chains along each interior line (Figure 2, Appendix). On each subplot, species and d.b.h. were recorded for all living trees within a radius of 26.33 feet from the center post (see 1/20-acre subplot record form, Appendix).

All trees within 1 chain of either side of each interior line were then examined. When a dead or dying tree was found, its location was plotted on a stem map. An axe blaze was put on two sides of each dead tree and the date placed thereon with a keel. The following data were recorded for each dead tree (see mountain pine beetle trend plot record, Appendix):

1. Species
2. D.b.h.
3. Crown class
4. Cause of death
5. Year of death

RESULTS

Ponderosa pine was the predominant species within the trend plot boundaries. According to the green stand cruise, ponderosa pine made up 93 percent of the stand followed by lodgepole pine and white fir at 3 percent each and juniper at 1 percent (Table 1, Appendix). In total, 365 living trees were tallied on the 20 1/20-acre plots. Average d.b.h. in inches for the plot trees was 7.1 for ponderosa pine, 5.1 for lodgepole pine, 4.8 for white fir, and 4.2 for juniper (Table 1, Appendix).

During the survey of the entire 10 acres, dead trees were tallied by year of death as follows: <1963; 1963; or 1964. No attempt was made to backdate mortality of trees killed prior to 1963. Previous experience had shown that cause of death is extremely hard to determine for some trees that have been dead for 2 or more years. A total of 1,251 dead ponderosa and 7 dead lodgepole pines was found on the plot (Table 2, Appendix). The mountain pine beetle caused 83 percent of the mortality and suppression 12 percent. A few mature or overmature ponderosa pines were removed from the plot within the last 5 years. Mechanical injury from this logging caused some mortality. A few trees were killed as a result of snow breakage. Cause of death was not determined for 6 trees.

The mountain pine beetle generally killed the larger trees that probably would have been the crop trees. Of the beetle-killed ponderosa pines, 62 percent were in the dominant and codominant crown classes (Table 3, Appendix). Groups of trees were killed rather than single trees according to the stem map (on file in the mountain pine beetle trend plot folder.)

TIME REQUIREMENTS

The plot was installed and rated by Regional Office personnel with the help of a Paisley District forester. Twenty man-days were required to complete plot installation as follows:

10 man-days to mark and measure all dead trees

4 man-days to establish exterior boundaries and interior lines

4 man-days for travel

2 man-days to rate the 20 1/20-acre plots

The amount of time required to install the plot was about twice as much as was originally anticipated because of the large number of dead trees.

IMPLICATIONS

According to Table 1, Forest Service Handbook 2473.1, the stand within the plot boundary is at near-ideal stocking (for low site 4; average d.b.h. for dominants and codominants 8 inches). Before the mountain pine beetle attacks began, the stand was overstocked. In essence then, the beetle has changed the density of the stand from overstocked to near ideally stocked. However, the beetle was not selective. Mainly the larger trees--the dominants and codominants--were killed. Also, groups of trees were killed, leaving openings in the stand. The stand probably is still overstocked in some places, so more mountain pine beetle tree killing may occur in the next two or three years.

Almost 90 percent of the total tree mortality occurred on the western half of the plot. Trees in this area were more dense and smaller than those on the eastern half. From all indications, overstocking and the resulting stagnation probably are the reasons for the present outbreak at Wooley Creek. It would be interesting to know if thinning in this area 5 years ago would have reduced or prevented the intensity of the outbreak.

RECOMMENDATIONS

1. A 2-man crew should assess this plot annually at least until the present outbreak subsides. At each annual examination, recently killed trees should be tallied and marked and d.b.h., crown class, cause of death, and year of death noted. Annual observations should require between 3 to 4 days for 2 men including travel to and from Portland.

2. Alternate methods for assessing mountain pine beetle damage and pattern of attacks should be considered before more plots are established in the Region. The method used on the Wooley Creek plot is satisfactory but very time consuming.

3. During future examinations, stem maps should be drawn at a larger scale. The present Wooley Creek trend plot stem map was made at a scale of 1 inch equals 1 chain (66 feet). This map is relatively useless because large groups of dead trees could not be located accurately.

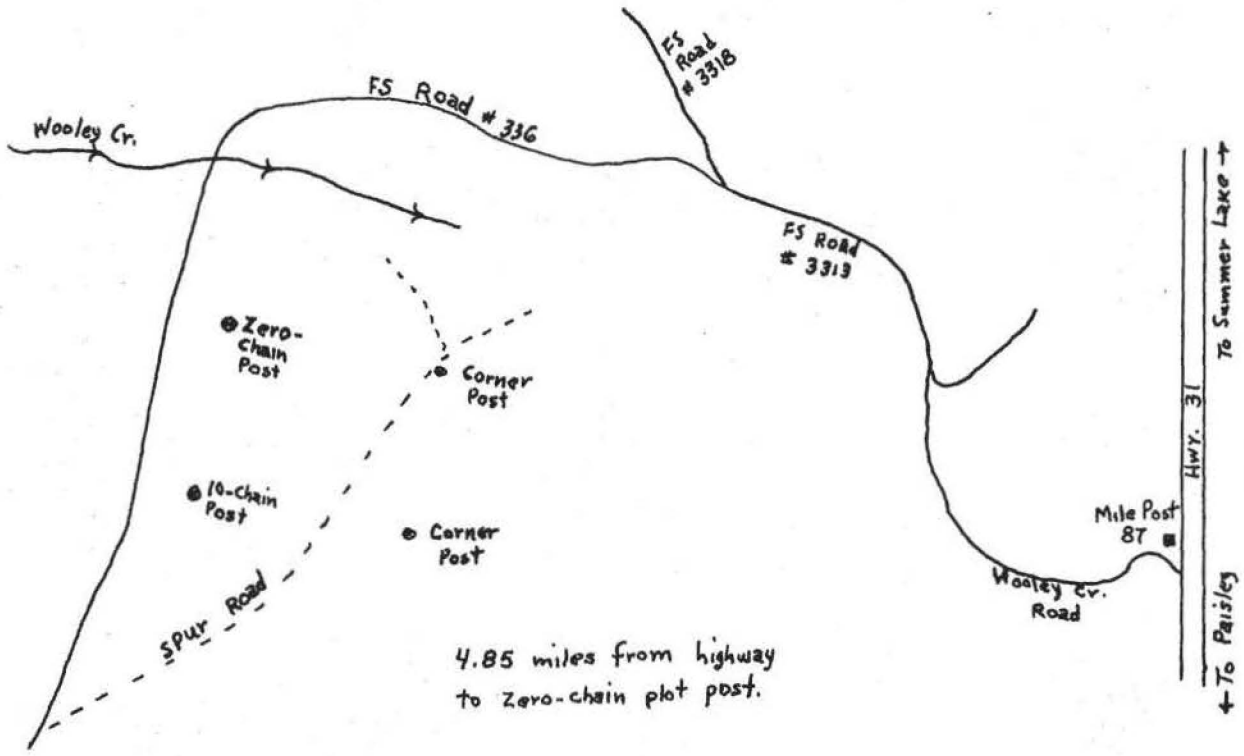

Figure 1.--Wooley Creek mountain pine beetle trend plot location, Paisley District, Fremont N.F., Oregon.

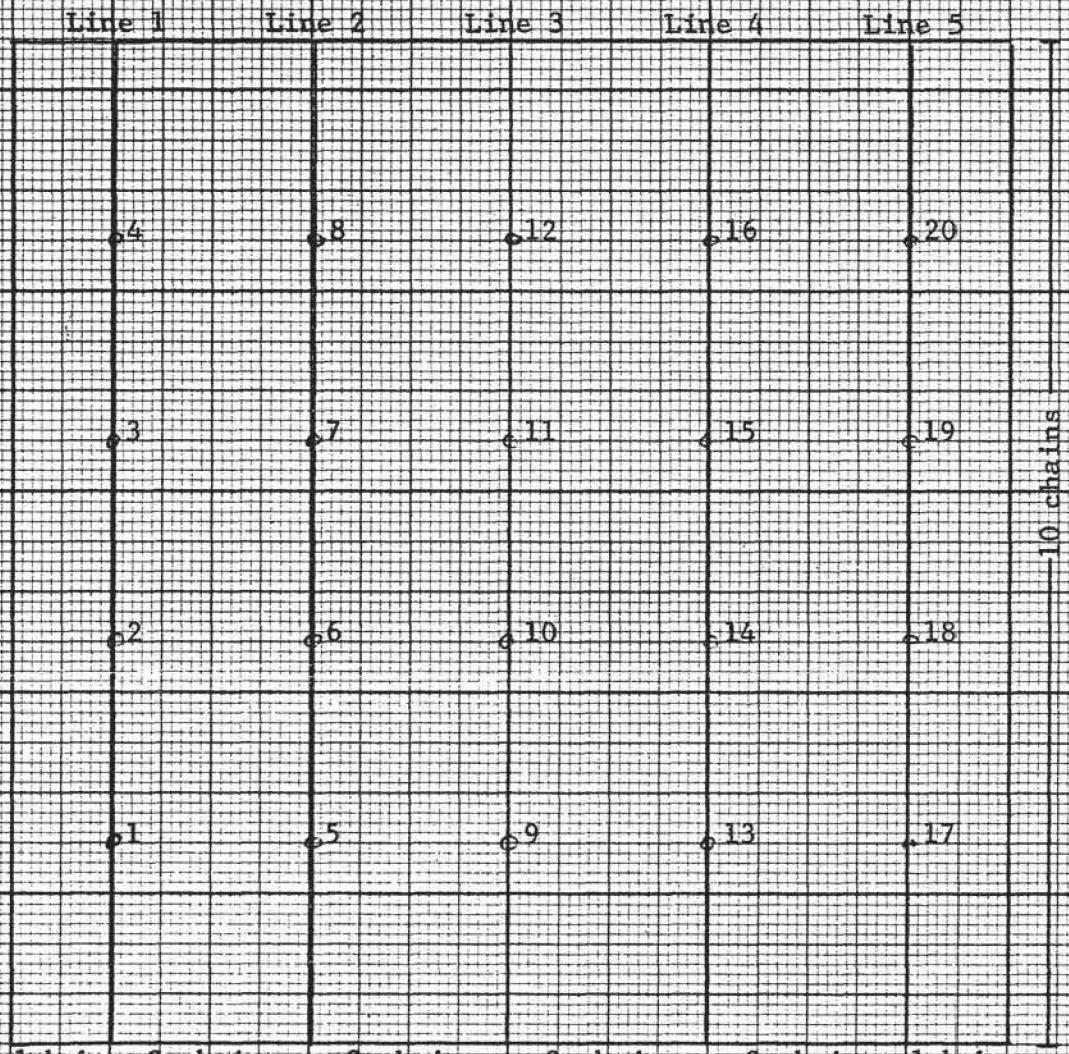

Figure 2.--Plot layout for 10-acre Mountain pine beetle trend study on the Paisley District, Fremont N.F.

PRINTED IN U.S.A.

EUGENE DIETZGEN CO. NO. 346 A

#6 5200

Mountain Pine Beetle Trend Plot Record

Date Examined _____ Plot _____ Location: Sec.____; T.____N;R.____W.

Examiners_____ National Forest _____

Line No.	Distance along line	Species	D.B.H.	Crown class	Cause of death	Year of death

#7 5200

Mountain Pine Beetle Trend Plot

1/20-Acre Subplot Record

Date Examined _____ Plot _____ National Forest _____

Examiners_____ Location: Sec. _____; T._____N.; R._____W.

Subplot no.	Line no.	Chain no.	Species	D.B.H.	Subplot no.	Line no.	Chain no.	Species	D.B.H.

Table 1.--Summary of data collected during a 10 percent green stand cruise of the Wooley Creek mountain pine beetle trend plot, Paisley District, Fremont National Forest, Oregon

Tree species	Stems per acre		D.B.H. of all trees	
	Number	Percent of total	Average	Range
Ponderosa pine	341	93.4	7.1	2.0 - 18.1
Lodgepole pine	12	3.3	5.1	2.2 - 7.9
White fir	10	2.7	4.8	2.4 - 12.2
Western juniper	2	0.6	4.2	2.2 - 6.1
Total	365	100.0	6.9	2.0 - 18.1

Table 2.--Summary of ponderosa pine mortality by cause of death on the Wooley Creek mountain pine beetle trend plot, Paisley District, Fremont National Forest, Oregon

Cause of death	Number of dead ponderosa pine trees			Total
	<1963	1963	1964	
Mountain pine beetle 1/	940	95	--	1,035
Suppression	138	12	--	150
Mechanical	14	18	--	32
Snowbreak	6	6	6	18
Mechanical and mountain pine beetle	6	2	--	8
Porcupine	2	--	--	2
Unknown	6	--	--	6
Total	1,112	133	6	1,251

1/ Plot was sampled before 1964 attacks were completed.

Table 3.--Crown class and average d.b.h. of all dead ponderosa pine by cause of mortality on the Wooley Creek mountain pine beetle trend plot, Paisley District, Fremont National Forest

Cause of mortality	Crown class								Total all classes	
	Dominant		Codominant		Intermediate		Suppressed			
	No.of trees	Ave. d.b.h.	No.of trees	Ave. d.b.h.	No.of trees	Ave. d.b.h.	No.of trees	Ave. d.b.h.	No.of trees	Ave. d.b.h.
Mountain pine beetle	249	9.00	393	6.84	362	5.13	31	3.58	1,035	6.66
Suppression	0	0	0	0	14	5.05	136	3.24	150	3.41
Mechanical	1	9.1	7	6.74	19	4.83	5	2.90	32	5.08
Snowbreak	0	0	4	7.08	13	4.95	1	3.10	18	5.32
Mechanical and mountain pine beetle	0	0	2	6.65	6	6.13	0	0	8	6.26
Porcupine	0	0	0	0	1	5.60	1	5.00	2	5.30
Unknown	0	0	0	0	5	3.28	1	2.20	6	3.10
Total	250	8.85	406	6.85	420	5.09	175	3.30	1,251	6.17